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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	
	:	Examiner: N.Y.A.
TIMOTHY MERRICK LONG)	
	:	Group Art Unit: 2771
Application No.: 09/612,440)	
	:	
Filed: July 7, 2000)	
	:	
For: COMBINING A PLURALITY)	
OF IMAGES AND	:	
TRANSFORMING AN IMAGE)	
HAVING ASSOCIATED	:	
META-DATA)	November 13, 2000

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Commissioner for Patents
Washington, D.C. 20231

CLAIM TO PRIORITY

Sir:

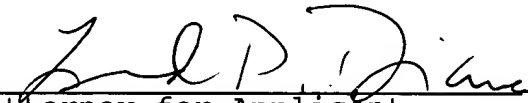
Applicant hereby claims priority under the International Convention and all rights to which he is entitled under 35 U.S.C. § 119 based upon the following Japanese Priority Application:

PQ 1525 filed on July 9, 1999.

A certified copy of the priority document is enclosed.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address given below.

Respectfully submitted,


Attorney for Applicant

Registration No. 28,284

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NY_MAIN 125497 v 1



Patent Office
Canberra

I, ANNA MAIJA EVERETT, ACTING TEAM LEADER EXAMINATION SUPPORT & SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 1525 for a patent by CANON KABUSHIKI KAISHA filed on 09 July 1999.

I further certify that pursuant to the provisions of Section 38(1) of the Patents Act 1990 a complete specification was filed on 06 July 2000 and it is an associated application to Provisional Application No. PQ 1525 and has been allocated No. 45063/00.

WITNESS my hand this
Thirteenth day of July 2000

A. M. Everett

ANNA MAIJA EVERETT
ACTING TEAM LEADER
EXAMINATION SUPPORT & SALES



CERTIFIED COPY OF
PRIORITY DOCUMENT

ORIGINAL

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION FOR THE INVENTION ENTITLED:

Digital Image Meta-Data

Name and Address
of Applicant:

Canon Kabushiki Kaisha, incorporated in Japan, of 30-2,
Shimomaruko 3-chome, Ohta-ku, Tokyo, 146, JAPAN

Name of Inventor: Timothy Merrick Long

This invention is best described in the following statement:

DIGITAL IMAGE META-DATA

Field of Invention

The current invention relates to digital image meta-data and the automatic
5 merging of meta-data fields in particular.

Description of Background art

Many digital image formats include meta-data which records aspects of an image that are in addition to the raw digital image pixel data. Examples of such attributes include a copyright notice, type of capture device, flash usage, type of lens, date of
10 capture, programs the image has been edited with, regions of interest, and more. In many image formats there are both well known meta-data items which, because of their standard-mandated identifiers and format, can be programmatically processed, as well as application specific meta-data items. These application specific meta-data items may be related to only one or a few programs or may be end-user invented and thus not
15 programmatically interpretable by any particular application.

There exist many computer application programs which combine digital images in various ways, or transform a single image. Examples include image editors such as Adobe PhotoShop. Other examples include panorama stitching applications that combine two or more partially overlapping images of the same scene into a single larger digital
20 image. When these applications produce a new digital image from one or more original digital images they must make decisions on what meta-data from the original image(s) is passed to the new image, what meta-data is discarded, or modified in some way. In the current state of the art, meta-data specific copying actions may be taken on meta-data elements which have well known characteristics. For example, a program may know to
25 preserve all copyright notices from all source images in the composite image because the characteristics of copyright notices are known to the application designer. But for application specific meta-data elements that are not known to the merging application designer there is currently no method of coding the application to have knowledge of how these meta-data elements should be treated. This invention solves this problem.

SUMMARY OF THE INVENTION

According to one aspect of the invention there is provided a method of combining image meta-data comprising the steps of: providing a plurality of images, each image having associated therewith at least one meta-data element; storing at least one self-describing attribute tag with said meta-data element for each said image, wherein
35 said attribute tag describes an action to be taken with said meta-data element of the first

one of said images and a corresponding meta-data element of a second one said images are combined; and combining the meta-data element of the first one of said images and a corresponding meta-data element of a second one of said images in accordance with said action.

According to another aspect of the invention there is provided apparatus for implementing the abovementioned method.

According to another aspect of the invention there is provided a computer program product comprising a computer program for implementing the abovementioned method.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a general purpose computer for implementing the preferred method.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

In the current invention any digital image meta-data elements may be augmented with an attribute which describes how that meta-data element from multiple images should be merged when the images are merged, or a new transformed image is created. In the preferred embodiment the meta-data associated with a digital image is recorded in XML format in a portion of the digital image. But it should be noted that many other methods of storing meta-data in a digital image exist and could be used. For example, the tag method of the TIFF image file format and the Structured Storage mechanism of the Flashpix image file format. An example of meta-data in XML format could be:

```
<?xml version="1.0">
<PHOTO>
  <Photo_Number>62</Photo_Number>
  <Lens>EF85mm f/1.2L USM</Lens>
  <Creator>Takashi Mochizuki</Creator>
  <Copyright>Takashi Mochizuki, 1999</Copyright>
  <ModelRelease desc="Man in blue suit"
    release="yes" ref="MR45621" />
  <EyeLocation>123 546 130 600</EyeLocation>
  ...
</PHOTO>
```

The present invention adds attributes to each XML element of the digital image meta-data to describe how that element should be combined with like elements of other

digital images when those images are combined. Similar mechanisms could be employed in on-XML based meta-data storage formats. The preferred embodiment allows the following merging attributes with the given interpretation:

discard

5 These elements should be discarded and no element of this name placed in the final image upon transformation or combination. An example of an element of this type is a region of interest which will become invalid through most transformations.

keepboth

 These elements should each be kept. Both should be placed in the final image.

10 An example of this type of element is a legal notice such as a model release note.

keepsame

 These elements should be kept as a single attribute if they have the same value, else both should be discarded. Example of these elements are camera capture characteristics such as whether a flash was used and date of capture.

15 keepone

 One of these elements should be chosen and copied to the final image at the application's discretion. Examples of these elements are captions or titles.

 Clearly other merging attributes are possible.

20 In the preferred embodiment the default action when no explicit merge attribute is supplied with a meta-data element is the *keepsame* action.

 An example of some digital-image meta-data with these attributes incorporated could be:

```
<?xml version="1.0">
```

```
<PHOTO>
```

```
    <Photo_Number>62</Photo_Number>
```

```
    <Lens>EF85mm f/1.2L USM</Lens>
```

```
    <Creator merge="keepboth">Takashi Mochizuki</Creator>
```

```
    <Copyright merge="keepboth">Takashi Mochizuki, 1999</Copyright>
```

```
    <ModelRelease merge="keepboth" desc="Man in blue suit"
```

```
        release="yes" ref="MR45621" />
```

```
    <EyeLocation merge="discard">123 546 130 600</EyeLocation>
```

```
</PHOTO>
```

35 The preferred method is preferably practiced using a conventional general-purpose computer system 100, wherein the processes may be implemented as software, such as an

application program executing within the computer system 100. In particular, the steps of the preferred method are effected by instructions in the software that are carried out by the computer. The software may be divided into two separate parts; one part for carrying out the preferred methods; and another part to manage the user interface between the latter and the user. The software may be stored in a computer readable medium, including the storage devices described below, for example. The software is loaded into the computer from the computer readable medium, and then executed by the computer. A computer readable medium having such software or computer program recorded on it is a computer program product. The use of the computer program product in the computer preferably effects an advantageous apparatus for implementing the preferred method in accordance with the embodiments of the invention.

The computer system 100 comprises a computer module 101, input devices such as a keyboard 102 and mouse 103, output devices including a printer 115 and a display device 114. A Modulator-Demodulator (Modem) transceiver device 116 is used by the computer module 101 for communicating to and from a communications network 120, for example connectable via a telephone line 121 or other functional medium. The modem 116 can be used to obtain access to the Internet, and other network systems, such as a Local Area Network (LAN) or a Wide Area Network (WAN).

The computer module 101 typically includes at least one processor unit 105, a memory unit 106, for example formed from semiconductor random access memory (RAM) and read only memory (ROM), input/output (I/O) interfaces including a video interface 107, and an I/O interface 113 for the keyboard 102 and mouse 103 and optionally a joystick (not illustrated), and an interface 108 for the modem 116. A storage device 109 is provided and typically includes a hard disk drive 110 and a floppy disk drive 111. A magnetic tape drive (not illustrated) may also be used. A CD-ROM drive 112 is typically provided as a non-volatile source of data. The components 105 to 113 of the computer module 101, typically communicate via an interconnected bus 104 and in a manner which results in a conventional mode of operation of the computer system 100 known to those in the relevant art. Examples of computers on which the embodiments can be practised include IBM-PC's and compatibles, Sun Sparcstations or alike computer systems evolved therefrom.

Typically, the application program of the preferred embodiment is resident on the hard disk drive 110 and read and controlled in its execution by the processor 105. Intermediate storage of the program and any data fetched from the network 120 may be

accomplished using the semiconductor memory 106, possibly in concert with the hard disk drive 110. In some instances, the application program may be supplied to the user encoded on a CD-ROM or floppy disk and read via the corresponding drive 112 or 111, or alternatively may be read by the user from the network 120 via the modem device 116.

5 Still further, the software can also be loaded into the computer system 100 from other computer readable medium including magnetic tape, a ROM or integrated circuit, a magneto-optical disk, a radio or infra-red transmission channel between the computer module 101 and another device, a computer readable card such as a PCMCIA card, and the Internet and Intranets including email transmissions and information recorded on
10 websites and the like. The foregoing is merely exemplary of relevant computer readable mediums. Other computer readable mediums may be practiced without departing from the scope and spirit of the invention.

The preferred method / may alternatively be implemented in dedicated hardware such as one or more integrated circuits performing the functions or sub functions of the
15 method. Such dedicated hardware may include graphic processors, digital signal processors, or one or more microprocessors and associated memories.

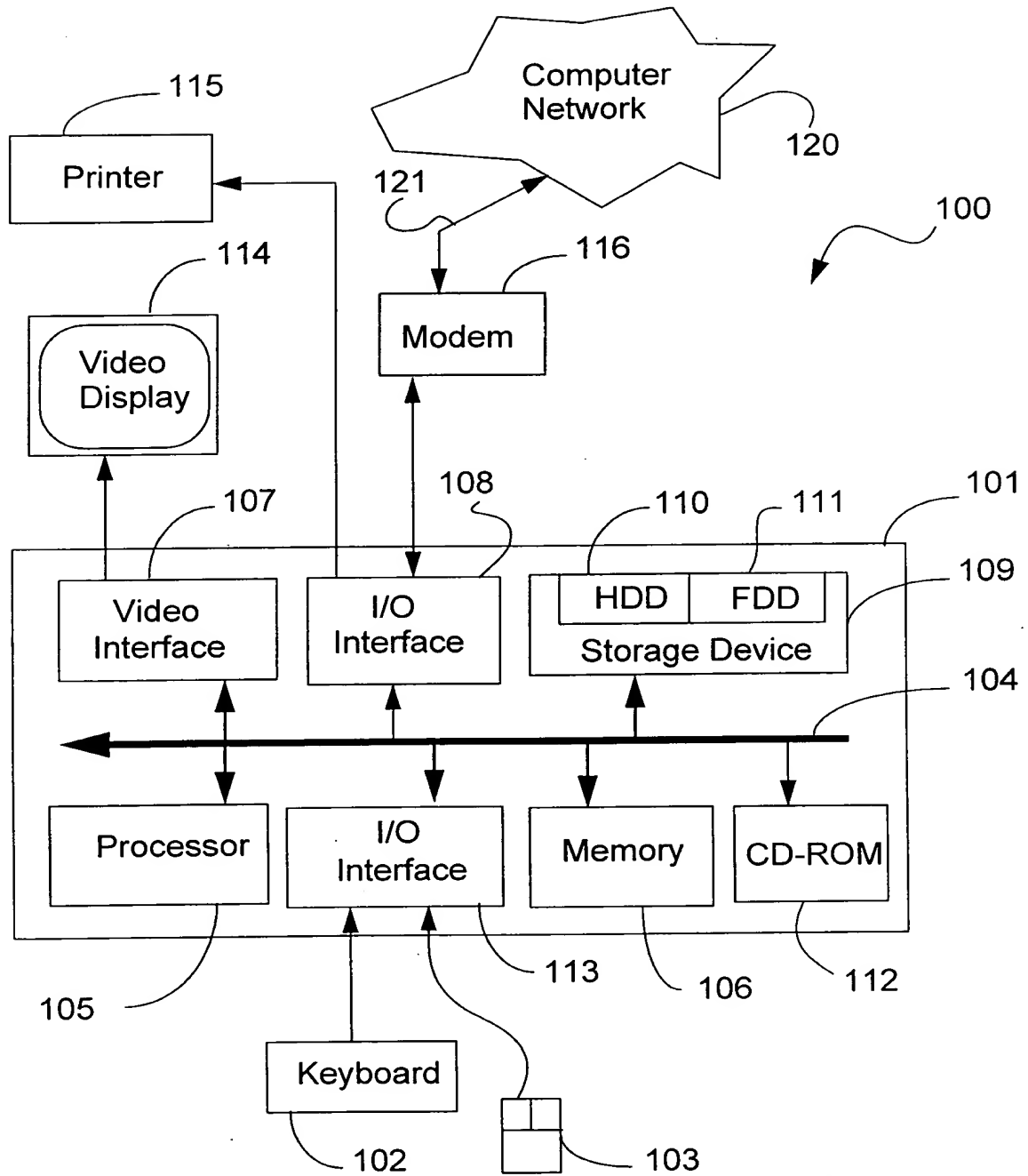
The foregoing describes only one embodiment/some embodiments of the present invention, and modifications and/or changes can be made thereto without departing from the scope and spirit of the invention, the embodiment(s) being illustrative and not
20 restrictive.

In the context of this specification, the word "comprising" means "including principally but not necessarily solely" or "having" or "including" and not "consisting only of". Variations of the word comprising, such as "comprise" and "comprises" have corresponding meanings.

The claims defining the invention are as follows:

1. A method of combining image meta-data comprising the steps of:
providing a plurality of images, each image having associated therewith at least
5 one meta-data element;
storing at least one self-describing attribute tag with said meta-data element for
each said image, wherein said attribute tag describes an action to be taken with said meta-
data element of the first one of said images and a corresponding meta-data element of a
second one said images are combined; and
10 combining the meta-data element of the first one of said images and a
corresponding meta-data element of a second one of said images in accordance with said
action.

Dated 9 July, 1999
Canon Kabushiki Kaisha
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON

**FIG. 1**